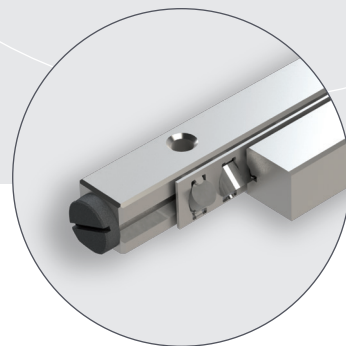
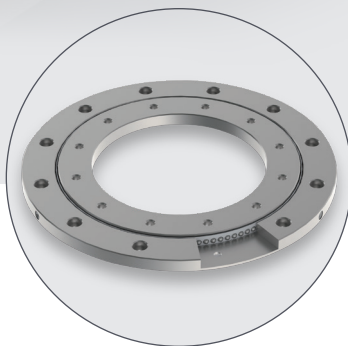
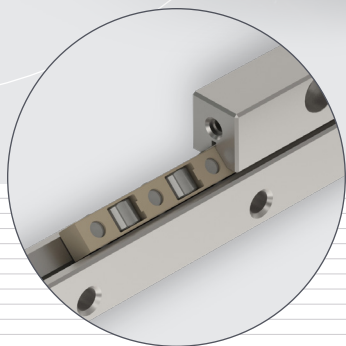
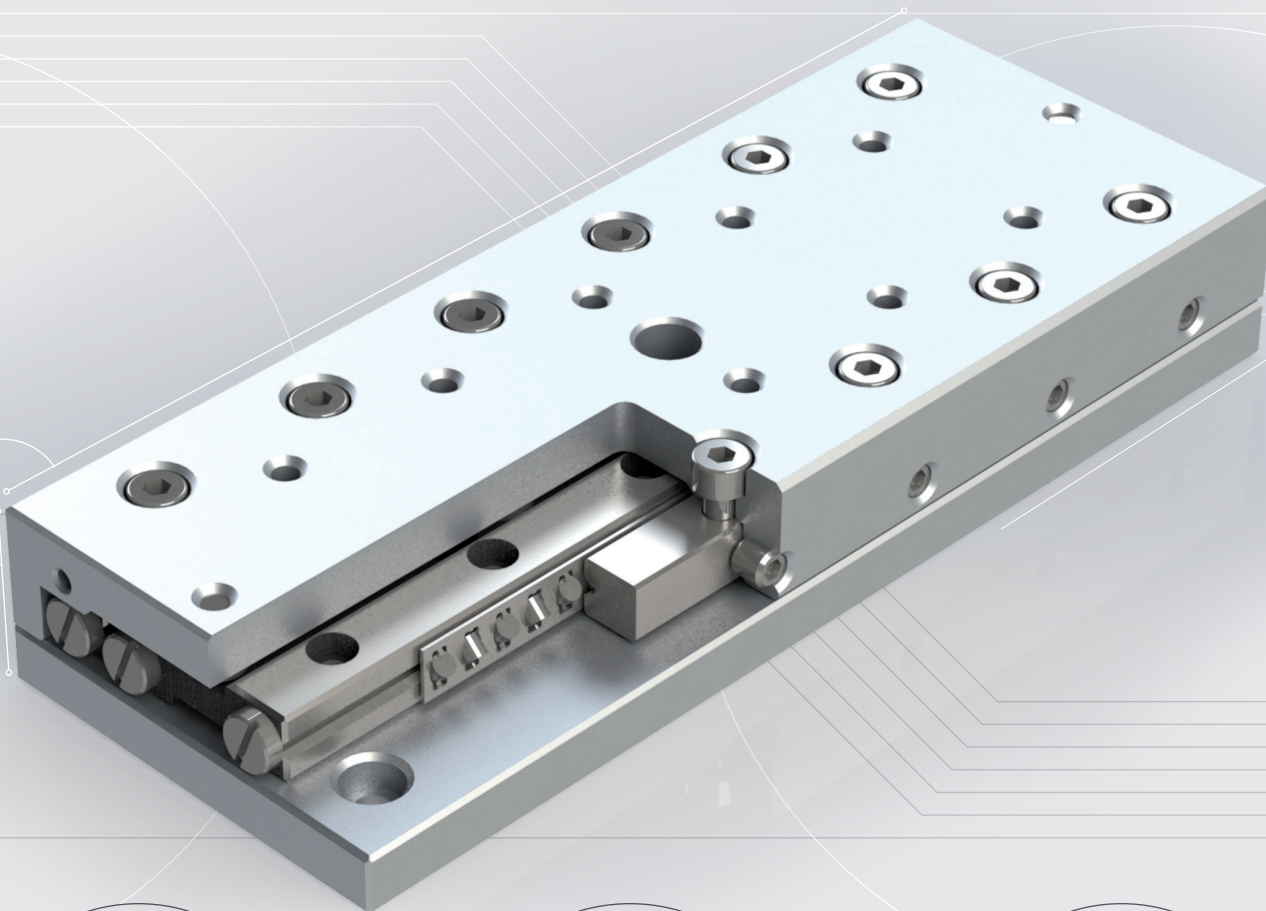




LINEAR BEARINGS TYPE M/V



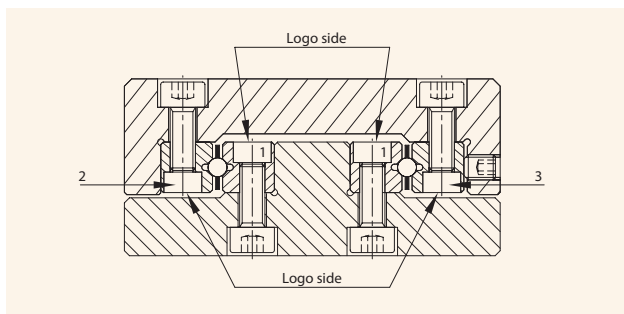
ASSEMBLY PROCEDURE

BEFORE START ASSEMBLY

PM linear bearings are precision components; they have to be handled with meticulous care. To achieve a perfect linear bearing, please pay due attention to the following notes:

- Be careful in handling the components. Do not drop it or hit it with anything like a hammer. Damages on the rail surface will have his impact on the running performance and operation life.
- Keep out any foreign material when mounting the rails.
- During assembly, all linear bearing components must have the same room temperature.
- For an uniform tightening of the bolts the use of a torque screw driver is recommended. Various models and bits are available. Please consult PM.

ASSEMBLY LINEAR BEARINGS



For a satisfying installation of all types of linear bearings in this catalog, the following should be observed:

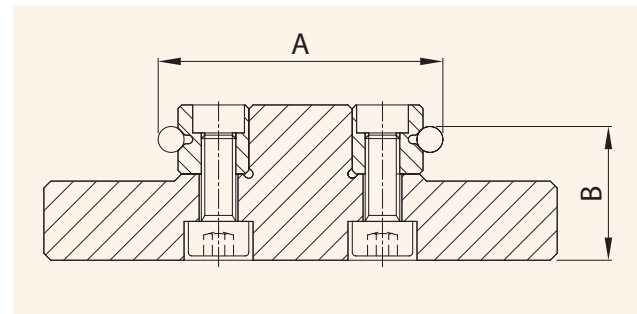
- 1) Fixing holes in the support structure (slide-base) should be "spotted through" from the holes in the rails. This is highly desirable as the original pitch of individual holes may have altered during hardening by as much as 0.4 mm. To compensate this, in part at least, special attachment screws type GD or GDN can be supplied. The dimensions of these are listed in the tables under the relative linear bearings for sizes.
- 2) Carefully de-burr and clean all constructional elements, to ensure a flat surface and a perfect seating of the rails.
- 3) The inner rail-pair (1), mounted "shoulder-to-shoulder" should be bolted down first, as follows: The base and reference face¹ of the linear bearing rails should be lightly oiled before they are clamped

against the mounting and reference shoulder.

They should then be bolted down by tightening up progressively, starting from one end and working to the other.

- 4) Parallelism of the V-tracks of the rails (A and B) should be checked. The tolerance must be within the tolerance of the linear bearings (page 14). When this has been done, the slide element in question is now ready for assembly.

Parallelism of rails V-track: ΔA und ΔB



- 4.1) The slide top can now be assembled. The fixed bearing rail (2) should be mounted as described at 3.1 above, but the adjustable rail (3) should only be screwed down lightly, to leave a gap between V-tracks for the insertion of ball-, roller- or needle cages.
- 5) This point only in cases where end stops are already inserted in the rail ends. Remove the end stop screws.
- 6) Carefully insert the cages. When the cages are exact in position, bolt down the adjustable V-rail lightly, until the screws are finger-tight.
- 7) Fit the end stop screws or end pieces.
- 8) The linear bearing set can now be play-free adjusted using the lateral preload setscrews. (chapter Preload Setting Linear Bearings, page 18).
- 9) Secure the attachment screws on the adjusting rail.
- 10) When assembly is finished, the linear bearings must be inspected for absence of play and for running the accuracy.



TABLES

RECOMMENDED PRELOAD SETTINGS

Table 1 Linear bearings RSD with roller cages

Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
1.5	3	M 2.5	10	0.75
2	4	M3	15	1.50
3	5	M5	25	4.50
4	7	M5	40	11.50
6	12	M6	100	18.50
9	14	M8	100	105.50
12	22	M10	100	176.50
15	20	M12	100	370.00

Table 2 Linear bearings RSD with ball cages

Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
1.5	3	M 2.5	10	0.20
2	4	M3	15	0.40
3	5	M5	25	1.10
4	7	M5	40	2.70
6	9	M6	50	4.00
9	14	M8	100	11.70
12	15.5	M10	100	25.00
15	20	M12	100	34.50

Table 3 Linear bearings RSDE with roller cages

Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
3	3.3	M5	25	16
4	4.4	M5	40	41
6	6.6	M6	50	86
9	On request			

Table 4 Linear bearings RNG with roller cages

Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
4	4.4	M3	25	14
6	6.6	M4	25	25

Table 5 Linear Bearings N/O and M/V with needle cages

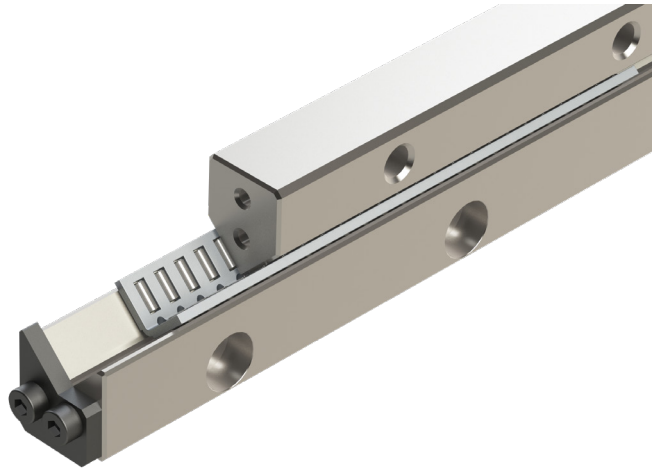
Roller size (mm)	Pitch cage (mm)	Setscrew	Pitch* (mm)	Preload (Ncm)
2	4.5	M6	50	1.05
2	4.5	M8	100	1.30
2.5	5	M8	100	2.70
2.5	5.5	M8	100	2.90
3	6	M12	100	5.70
3.5	7	M14	100	7.70

RECOMMENDED TIGHTENING TORQUE FOR ATTACHMENT SCREWS

Table 6 Tightening torque strength grade 12.9

Max. Tightening torques (Ncm)		
Size	Tightening Torque DIN 912	Attachment screws GD and GDN
M2	0.60	0.48
M3	2.00	1.60
M4	4.90	3.92
M5	9.60	7.68
M6	17.00	13.60
M8	41.00	32.80
M10	79.00	63.20
M12	140.00	112.00
M14	220.00	176.00

*pitch between the preload setscrews



Linear needle bearings type N/O and M/V are suitable to support and guide high loads and moments very accurate. Due to the close arranged needle rollers they provide extremely high rigidity, high linear motion accuracy and a compact size. Often used in the machine tool industry.

STRUCTURE AND FEATURES

A typical installation consists of 2 pairs of linear bearings; each pair is made up of (2) rails, 1, N-type (female) and 1, O-type (male), through-hardened and precision ground, with one needle roller cage in-between.

The rails are made to very high tolerances and matched together as a set. Mixing components from different sets may affect the accuracy.

Rails are equipped with countersunk-bored attachment holes, according to a standard configuration. Threaded holes in ends for fixing endstops and wipers. For the attachment, special screws type GD can be ordered separately. (see page 31).

NOTES BY ORDERING

Normally one set linear bearings consists of:
4 pcs. rails (= 2 pairs), 2 pcs. needle cages and 8 pcs. end stops (2 · N or M-type + 2 x O or V-type).

By ordering please specify the following data:

- Quantity and type of rails
- Quantity and type of cages or max. stroke
- Quantity and type of end stop screws or end stop pieces with or without wipers

In case of end stop GH with GH-A wipers, and end stop GW with GW-A wipers only 4 pcs are needed.

Example:

To order one linear bearing set of 600 mm length, size 2025 for a 350 mm stroke in standard quality please specify:

- 2 pcs. Rails N-2025x600
- 2 pcs. Rails O-2025x600
- 2 pcs. Needle cages HW-15x425 mm
- 4 pcs. End pieces GFN-2025
- 4 pcs. End pieces GFO-2025

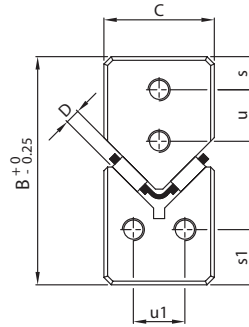
Example:

To order one linear bearing set of 300 mm length, size 3015 for a 150 mm stroke in standard quality please specify:

- 2 pcs. Rails M-3015x300
- 2 pcs. Rails V-3015x300
- 2 pcs. Needle cages HW-10x225 mm
- 2 pcs. End pieces EM-3015
- 2 pcs. End pieces EAM-3015



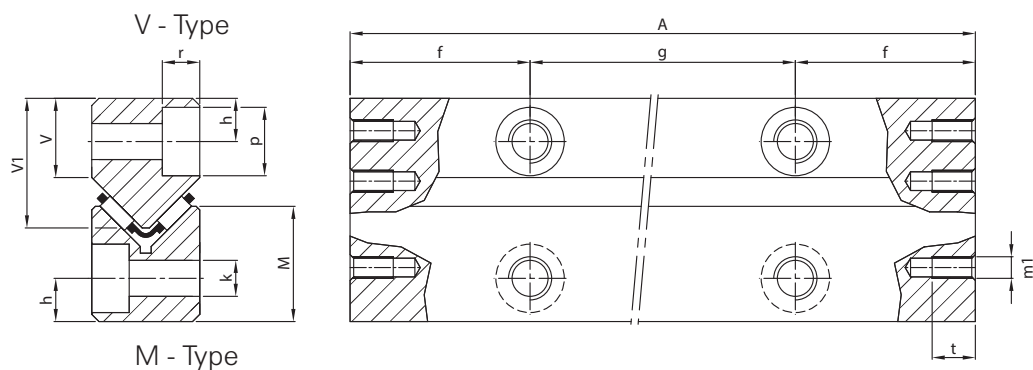
M / V



Rail type		Main dimensions							Mounting holes			
M-Type	V-Type	A	B	C	M	V	V1	D	f	g	h	k
M-3015x100	V-3015x100	100	30	15	15.5	10.5	17	2	15	2x35	5.3	5.3
M-3015x150	V-3015x150	150							15	3x40		
M-3015x200	V-3015x200	200							20	4x40		
M-3015x300	V-3015x300	300							30	6x40		
M-3015x400	V-3015x400	400							20	9x40		
M-3015x500	V-3015x500	500							30	11x40		
M-3015x600	V-3015x600	600							20	14x40		
M-3015x700	V-3015x700	700							30	16x40		
M-3015x800	V-3015x800	800							20	19x40		
M-3015x900	V-3015x900	900							30	21x40		
M-3015x1000	V-3015x1000	1000							20	24x40		
M-4020x200	V-4020x200	200	40	20	22.5	13.5	22	2	20	2x80	7.5	7.5
M-4020x300	V-4020x300	300							30	3x80		
M-4020x400	V-4020x400	400							40	4x80		
M-4020x500	V-4020x500	500							50	5x80		
M-4020x600	V-4020x600	600							20	7x80		
M-4020x700	V-4020x700	700							30	8x80		
M-4020x800	V-4020x800	800							40	9x80		
M-4020x900	V-4020x900	900							50	10x80		
M-4020x1000	V-4020x1000	1000							20	12x80		
M-4020x1100	V-4020x1100	1100							30	13x80		
M-4020x1200	V-4020x1200	1200							40	14x80		

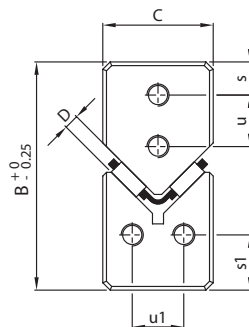
Bold = Short lead time item

Regular = Long lead time item - please request for price and delivery time



		End holes						Weight (g)		Type M/V	Accessories
p	r	m1	s	s1	t	u	u1	Type M	Type V		
8.5	4.5	M3	5.5	8	7	7	7	143	161	3015x100	Cage: HW-10 End pieces: EM, EV 3015 Wiper EAM, EAV 3015 Attachment screw: GD-6
								215	242	3015x150	
								286	322	3015x200	
								429	483	3015x300	
								572	644	3015x400	
								715	805	3015x500	
								858	966	3015x600	
								1001	1127	3015x700	
								1144	1288	3015x800	
								1287	1445	3015x900	
								1430	1610	3015x1000	
11.5	6.8	M5	5.5	10	8	10.5	11	588	554	4020x200	Cage: HW-15, FF-2025-ZW End pieces: EM, EV 4020 Wiper EAM, EAV 4020 Attachment screw: GD-4020
								882	831	4020x300	
								1176	1108	4020x400	
								1470	1385	4020x500	
								1764	1662	4020x600	
								2058	1939	4020x700	
								2352	2216	4020x800	
								2646	2493	4020x900	
								2940	2770	4020x1000	
								3234	3047	4020x1100	
								3528	3324	4020x1200	

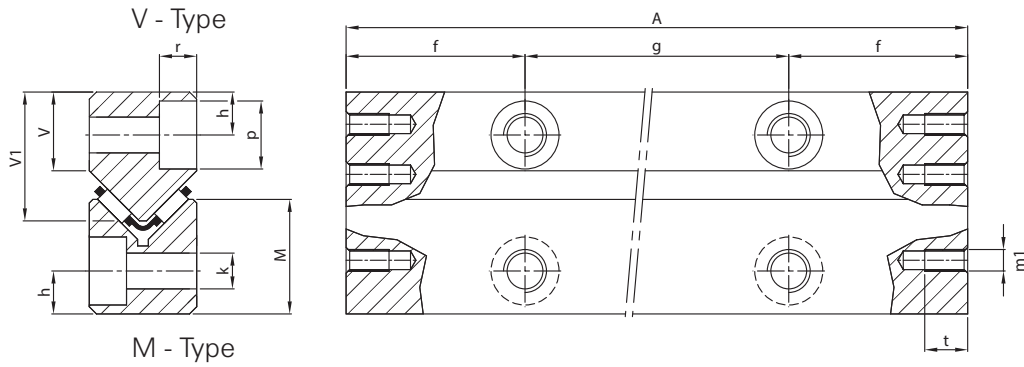
Units: mm



Rail type		Main dimensions							Mounting holes			
M-Type	V-Type	A	B	C	M	V	V1	D	f	g	h	k
M-5025x200	V-5025x200	200							20	2x80		
M-5025x300	V-5025x300	300							30	3x80		
M-5025x400	V-5025x400	400							40	4x80		
M-5025x500	V-5025x500	500							50	5x80		
M-5025x600	V-5025x600	600							20	7x80		
M-5025x700	V-5025x700	700	50	25	28	17	28	2	30	8x80	10	7.5
M-5025x800	V-5025x800	800							40	9x80		
M-5025x900	V-5025x900	900							50	10x80		
M-5025x1000	V-5025x1000	1000							20	12x80		
M-5025x1100	V-5025x1100	1100							30	13x80		
M-5025x1200	V-5025x1200	1200							40	14x80		
M-6035x300	V-6035x300	300							50	2x100		
M-6035x400	V-6035x400	400							50	3x100		
M-6035x500	V-6035x500	500							50	4x100		
M-6035x600	V-6035x600	600							50	5x100		
M-6035x700	V-6035x700	700	60	35	35	20	35.5	2.5	50	6x100	11	10
M-6035x800	V-6035x800	800							50	7x100		
M-6035 x900	V-6035x900	900							50	8x100		
M-6035x1000	V-6035x1000	1000							50	9x100		
M-6035x1100	V-6035x1100	1100							50	10x100		
M-6035x1200	V-6035x1200	1200							50	11x100		

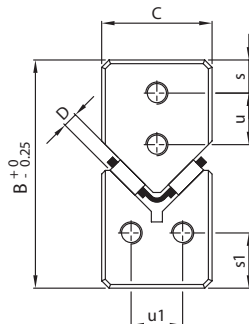
Bold = Short lead time item

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p	r	End holes						Weight (g)		Type M/V	Accessories
		m1	s	s1	t	u	u1	Type M	Type V		
11.5	6.8	M6	7	12	9	13	13	888	882	5025x200	Cage: HW-15, FF-2025-ZW End pieces: EM, EV-5025 Wiper EAM, EAV-5025 Attachment screw: GD-5025
								1332	1323	5025x300	
								1776	1764	5025x400	
								2220	2205	5025x500	
								2664	2646	5025x600	
								3108	3087	5025x700	
								3552	3528	5025x800	
								3996	3969	5025x900	
								4440	4410	5025x1000	
								4884	4851	5025x1100	
								5328	5292	5025x1200	
15	9	M6	8	14	9	18	20	2211	2304	6035x300	Cage: HW-20, FF-2535-ZW End pieces: EM, EV-6035 Wiper EAM, EAV-6035 Attachment screw: GD-6035
								2948	3072	6035x400	
								3685	3840	6035x500	
								4422	4608	6035x600	
								5159	5376	6035x700	
								5859	6144	6035x800	
								6633	6912	6035x900	
								7370	7680	6035x1000	
								8107	8448	6035x1100	
								8844	9216	6035x1200	

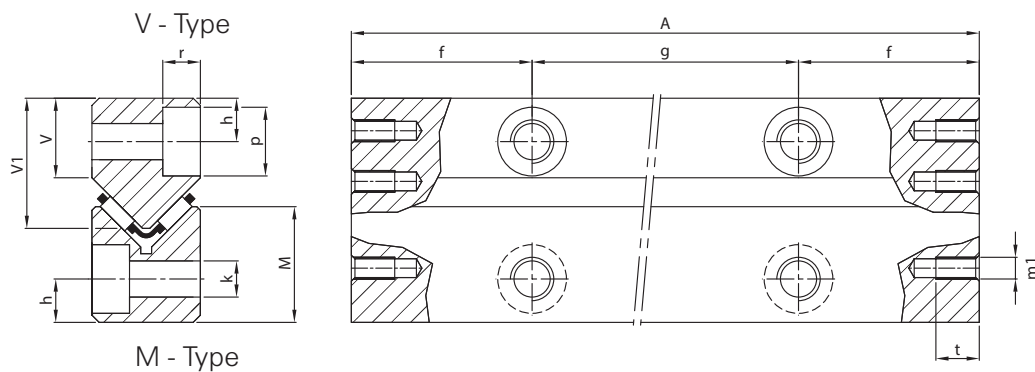
Units: mm



Rail type		Main dimensions							Mounting holes			
M-Type	V-Type	A	B	C	M	V	V1	D	f	g	h	k
M-7040x300	V-7040x300	300							50	2x100		
M-7040x400	V-7040x400	400							50	3x100		
M-7040x500	V-7040x500	500							50	4x100		
M-7040x600	V-7040x600	600							50	5x100		
M-7040x700	V-7040x700	700	70	40	40	24	40	3	50	6x100	13	12.5
M-7040x800	V-7040x800	800							50	7x100		
M-7040x900	V-7040x900	900							50	8x100		
M-7040x1000	V-7040x1000	1000							50	9x100		
M-7040x1100	V-7040x1100	1100							50	10x100		
M-7040x1200	V-7040x1200	1200							50	1x100		
M-8050x300	V-8050x300	300							50	2x100		
M-8050x400	V-8050x400	400							50	3x100		
M-8050x500	V-8050x500	500							50	4x100		
M-8050x600	V-8050x600	600							50	5x100		
M-8050x700	V-8050x700	700	80	50	45	26	48.5	3.5	50	6x100	14	6.8
M-8050x800	V-8050x800	800							50	7x100		
M-8050x900	V-8050x900	900							50	8x100		
M-8050x1000	V-8050x1000	1000							50	9x100		
M-8050x1100	V-8050x1100	1100							50	10x100		
M-8050x1200	V-8050x1200	1200							50	11x100		

Bold = Short lead time item

Regular = Long lead time item - please request for price and delivery time



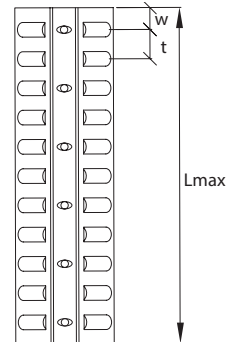
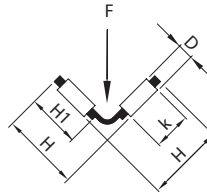
p	r	End holes						Weight (g)		Type M/V	Accessories
		m1	s	s1	t	u	u1	Type M	Type V		
18.5	11	M6	10	16	9	20	20	2787	2982	7040x300	Cage: HW-25, FF-3045-ZW End pieces: EM, EV-7040 Wiper EAM, EAV-7040 Attachment screw: GD-7040
								3716	3976	7040x400	
								4645	4970	7040x500	
								5574	5964	7040x600	
								6503	6958	7040x700	
								7432	7952	7040x800	
								8361	8946	7040x900	
								9290	9940	7040x1000	
								10219	10934	7040x1100	
								11148	11928	7040x1200	
20	13	M6	10	20	9	25	30	3987	4438	8050x300	Cage: HW-30, FF-3555-ZW End pieces: EM, EV-8050 Wiper EAM, EAV-8050 Attachment screw: GD-8050
								5316	5784	8050x400	
								6645	7230	8050x500	
								7974	8676	8050x600	
								9303	10122	8050x700	
								10632	11568	8050x800	
								11961	13014	8050x900	
								13290	14460	8050x1000	
								14619	15906	8050x1100	
								15948	17352	8050x1200	

Units: mm

ACCESSORIES

Needle cages type HW, size 10 - 30

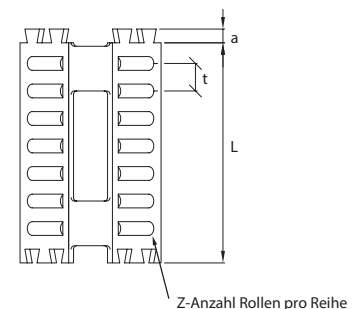
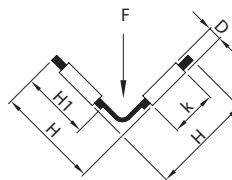
- Needles are retained
- For horizontal and vertical installation
- Material brass / light-alloy
- For protruding cages
- For temperatures up to 150 °C



Length tolerance due to roller distance t : $L \pm 0/-t$

Needle cages type FF-ZW, size 2025 - 3555

- Needles are retained
- For horizontal and vertical installation
- Material plastic
- For temperatures up to 120 °C



Dovetail grooves on both sides of the cage elements for an easy connection of any number of elements.

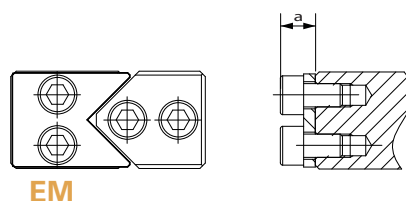
For bending the cage the elements need to be heated to + 70 °C to + 90 °C and bend to the desired angle.

Cage type		Main dimensions									Z	Load rating	
FF.ZW	HW	D	H	H1	a	k	L	t	w	Lmax		C_{dyn}^1 (N)	C_0 (N)
FF-2025-ZW	HW-10	2	10	8	-	4.8	-	4	3	2000	-	21400	62700
	HW-15	2	15	10	2	6.8	32	4	-	-	7	25900	87500
FF-2535-ZW	HW-20	2.5	20.5	15	2.4	9.8	45	5	-	-	8	39600	130600
	HW-25	2.5	20	14.3	-	9.8	-	5.5	3.5	2000	-	40300	133500
FF-3045-ZW	HW-25	3	26	20	3	13.8	60	6	-	-	9	57900	188500
	HW-30	3.5	31.5	25	3.2	17.8	75	7	-	-	10	62900	209400
FF-3555-ZW	HW-30	3.5	30	24	-	17.8	-	7	5	2000	-	78400	250900
												82700	268700

1) The dynamic load rating C_{dyn} for a theoretical cage length of 100 mm in load direction "F" as shown in the figure.

End pieces type EM/EV, size 3015 - 8050

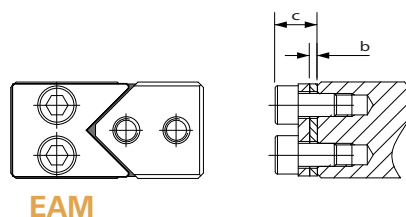
- For horizontal and vertical installation
- Available with Wiper Type EAM and EAV



EM

Felt wiper EAM, size 3015 - 8050

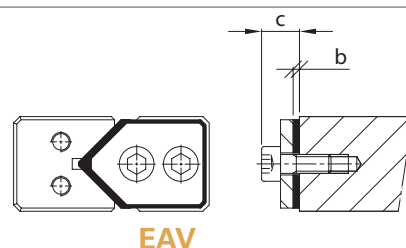
- For horizontal and vertical installation



EAM

Felt wiper EAV, size 3015 - 8050

- For horizontal and vertical installation

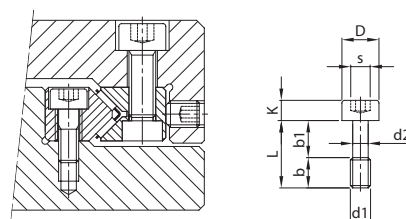


EAV

Main dimensions	Rail M/V					
	M/V 3015	M/V 4020	M/V 5025	M/V 6035	M/V 7040	M/V 8050
a	5	8	9	9	9	9
b	2	2	2	2	2	2
c	7	10	11	11	11	11

Attachment screw GD, size 6 - 8050

- For compensation of pitch distances between mounting holes
- Recommended for the installation of the preload rail



Type	Main dimensions								Rail Type	Max. Tightening torque (Nm) ¹
	L	b	b1	D	d1	d2	K	s		
GD-6	20	8	12	8	M5	3.9	5	4	M/V-3015	4.6
GD-4020	30	12	18	8.5	M6	4.6	6	5	M/V-4020	7.3
GD-5025	35	16	19	11.3	M8	6.2	8	6	M/V-5025	19.2
GD-6035	40	18	22	13.9	M10	7.9	10	8	M/V-6035	38.4
GD-7040	50	25	25	15.8	M12	9.6	12	10	M/V-7040	66.4
GD-8050	60	25	3	15.8	M12	9.6	12	12	M/V-8050	66.4

¹ For strength grade: 12.9

PM RESEARCH AND PRODUCTION FACILITY



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